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THE FISHES OF LONG LAKE, ONTARIO

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Long Lake drains into Hudson bay through the Kenogami and Albany rivers. It was for this reason chosen for our investigation, in order that conditions might be compared with those of Lake Nipigon, which is in approximately the same latitude, and has the same general physical and climatic features, but lies in the Great Lakes basin.

The lake is situated in Thunder Bay district between 86° 33′ and 87° 7′ west longitude and 49° 8′ and 49° 47′ north latitude. The altitude is 1,017 feet above mean sea level. The lake is long and narrow, extending about fifty-two miles in a northeast-southwest direction and varying from a quarter of a mile to two miles in width, being very narrow at the south end. About fifteen miles from the north end of the lake is "The Narrows", which incompletely divides the lake into two parts.

In the lake are some fifty islands ranging in size from rocky shoals to wooded islands half a mile in diameter.

The shores are abrupt and clean, with some sand and gravel beaches which usually slope steeply into deep water. Owing to wave action, most of these beaches are free of higher aquatic vegetation. In the shelter of a point at the north end of the lake there is one fairly extensive reed bed. Smaller reed beds occur in the few well-sheltered bays.

The deepest part of the lake is that immediately north of "The Narrows", where we sounded 112 ft. South of "The Narrows" a depth of 72 ft. was obtained. At the extreme north end the lake is quite shallow, with a gradually sloping sandy bottom. Here are found extensive areas of potamogetons.

No large rivers enter Long Lake, but it is fed by numerous small streams. This condition is to be expected from the

narrow watershed. The whole drainage covers about seven hundred square miles.

Long Lake occupies one of a great number of linear rock trenches which abound in certain parts of the precambrian shield. These trenches are presumably the results of faulting in the Keweenawan age, and have in a general way controlled the channels of stream erosion since then, although the drainage pattern is now much modified by deposits of glacial drift. There is evidence that at a certain stage Lake Algonquin was connected through the Long Lake trench with a great post-glacial lake on the site of the present clay belt. With the retreat of the ice, the water level of Lake Algonquin dropped below the height of land and the essential features of the present drainage were established.

The country surrounding Long Lake is characterized by heavily wooded hills. These reach a height of four hundred feet at the south end of the lake, but become less prominent and finally disappear toward the north. The forest consists chiefly of black and white spruce, balsam, Jack pine, aspen, balsam poplar, and birch, with the white cedar and mountain ash coming into evidence in association with the Jack pine on the warm slopes at the south end of the lake. Tamarack and black ash are found on the lower ground. The high plateaus at the south end of the lake have been largely burned over, and now bear a profusion of blueberry bushes and Jack pines, with alder thickets in catchbasins between ridges of bare gneiss.

Physical conditions in Long Lake were found to be similar to those of Lake Nipigon. The water of the lake is rather dark in colour, but not turbid. The colour as determined by the U.S. Geological Survey standard colorimeter was 27 on August 20, 1924. Seechi's disc was visible to a depth of 13 ft. 8 in. at 5 p.m., August 24, 1924. The following series of temperatures were obtained:

TABLE 1. Temperatures (centigrade) at two stations in Long Lake, 1924

Depth in yds	Immediately south of "The Narrows," Aug. 24, 5.20 p.m.	Near north end of lake Aug. 20, 3 p.m.
Surface	16.1	16.8
3	—	15.5 (bottom)
5	15.7	
10	15.5	
15	15.3	
20	14.3	
24	13.7 (bottom)	
Air	18.0	19.5

Following are pH determinations made near the north end of the lake on August 20, 1924:

	Surface	Bottom
To phenol red.....	7.9	7.8
To cresol red.....	7.8	7.8

The chemical content of the water near the north end of the lake was found to be as follows on August 20, 1924:

TABLE 2. Chemical analyses of water of Long Lake

	O_2 cc. per litre	CO_2 parts per million	Bicarbonate parts per million	Total acidity parts per million
Surface	6.05	0.1	64.7	4.2
Bottom	5.94	0.1	68.3	6.0
(3 yrd.)				

The total time spent on the lake was 17 days as follows: Aug. 1924, 4 days; Sept. 1925, 8 days; Aug. 1926, 5 days.

METHODS

Fish were taken by the use of small meshed seines and gill nets of $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, and 5 inch stretched mesh. These were used in all possible habitats. The stomach contents of predaceous fish were examined. A single specimen of *Cottus ricei* was taken from the stomach of a ling.

The proportionate measurements are based entirely on the fish measured after preservation in alcohol. Length in inches represents the distance from the end of the snout to the fork of the tail. The length in centimeters is the distance from the tip of the snout to the end of the vertebral column. Parts of the body and head were measured as follows: Head length from the tip of the snout to the posterior margin of the operculum exclusive of the opercular membrane; snout and maxillary from the tip of the snout to the anterior edge of the orbit and the posterior margin of the maxillary respectively; caudal peduncle length along the lateral line from the end of the vertebral column to the place directly over the posterior part of the anal insertion. The scales in the lateral line include only those to the end of the spinal column. Scales above the lateral line are the number of rows from the side of the dorsal insertion to, but not including, the lateral line. Scales below the lateral line are the number of rows from the side of the pelvic insertion to, but not including, the lateral line. Short rays at the front of a fin are not counted unless two thirds of the maximum length.

ECONOMIC IMPORTANCE

At the present time there is no commercial fishing in Long Lake. Although the lake, on account of its size, is not capable of producing very large quantities of fish, it would support a limited amount of commercial fishing. The fish of economic importance are the blackfin, the whitefish, and the lake trout.

The abundance of game fish in the region is sufficient to warrant the encouragement of an increased tourist traffic to the Long Lake district. The lake contains excellent lake trout as well as pickerel, while the neighbouring streams abound with brook trout.

The suckers and the ling are economically detrimental. The suckers consume considerable quantities of food of whitefish, while the ling destroy large numbers of blackfin and whitefish. In commercial fishing elsewhere the taking of ling and suckers in large numbers is avoided as far as possible.

As a result of this, these fish tend to increase in numbers relatively to those species which are of commercial importance. Unless some means can be devised for reducing the numbers of these non-commercial fish, they will continue to increase at the expense of the more valuable sorts. If no market can be developed for them as food fishes, it may be found profitable to remove them from the waters for reduction to fish meal and fish oil of various kinds.

If further planting of fry is carried on in Long Lake it seems advisable to pay special attention to the lake trout, as it is, in addition to being a fish of commercial value, much sought after on account of its game qualities.

FAUNAL RELATIONSHIPS

Our investigations have shown twenty-one species of fish in Long Lake. All of these species occur in Lake Nipigon although some, such as the blackfin (*L. nigripinnis*), the log perch (*P. caprodes*), and the miller's thumb (*C. cognatus*), appear to be much more plentiful in Long Lake than in Lake Nipigon.

Most noticeable by their absence from Long Lake are the ciscoes, of which only one species occurs in contrast to six in Lake Nipigon. The absence of five species of minnows is to some extent due to the fact that our efforts were confined to the main lake and that none of the smaller muskeg lakes of the district was visited. The absence of the tesselated darter (*B. nigrum olmstedi*) appears significant, as it is also absent from Lake Abitibi, which is in the Hudson bay drainage, but it is very common in Lake Nipigon.

In view of the fact that small lakes and streams were not carefully studied, owing to lack of time, it is probable that further work would add several species to the list of Long Lake fishes.

Coregonus clupeaformis (Mitchill). COMMON WHITEFISH

The following proportionate measurements are the averages obtained for twelve specimens. Length 21.4 cm. (12.7-41.9); width 8.5 (7.3-9.9); depth 4.2 (3.3-5.0); head 4.4 (4.1-4.7) in length; eye 4.4 (3.7-5.0); snout 4.1 (3.6-5.0); interorbital 3.9 (3.2-4.4); maxillary 3.7 (3.2-4.4); length of caudal peduncle 1.8

(1.6-2.2) in head, its depth 1.4 (1.3-1.7) in its own length; dorsal fin with 11 rays, sometimes 10 or 12, its base 1.8 (1.7-2.0) in head and 1.5 (1.3-1.6) in its own height; anal fin with 11 rays, sometimes 12 and less often 10, its base 1.9 (1.4-2.2) in head and 1.1 (1.0-1.3) in its own height; pectoral length 1.3 (1.0-1.4) and ventral length 1.4 (1.2-1.7) in head; scales 10 (11-8), 80 (88-71), 9 (11-8); gill rakers 17+10 (16+10 to 17+11). Largest specimen 18¼ inches.

The whitefish is fairly common in Long Lake. In the fall of 1924 a considerable number of small whitefish showing only one winter ring on the scale were taken at the north end of the lake. These may represent some of the million fry planted by the Provincial Government in 1923. Fry have been planted at various times as follows:

1920— 500,000	1923—1,000,000
1921—1,000,000	1924—1,000,000
1922—1,000,000	

Leucichthys nigripinnis (Gill). BLACKFIN

The following proportionate measurements are the averages obtained for thirty-three specimens. Length 20.6 cm. (13.0-33.0); width 8.6 (6.5-11.3); depth 4.4 (3.3-6.1); head 3.8 (3.4-4.6) in length; eye 4.1 (3.4-4.7); snout 3.8 (3.1-4.2); interorbital 4.6 (3.7-6.0); maxillary 2.6 (2.1-2.8); length of caudal peduncle 2.1 (1.5-2.6) in head, its depth 1.5 (1.2-1.9) in its own length; dorsal fin, with 10 rays, sometimes 11 and less often 12, its base 2.3 (1.9-2.7) in head and 1.7 (1.3-2.1) in its own height; anal fin with 10 or 11 rays, more rarely 12 or 13, its base 2.6 (2.1-3.0) in head and 1.1 (.9-1.4) in its own height; pectoral length 1.4 (1.1-1.6) and ventral length 1.4 (1.2-1.6) in head; scales 8 (10-7), 69 (78-63), 8 (9-7); gill rakers 31+18(35+19 to 26+17). Largest specimen 14¼ inches.

This species is very common in depths of 30 to 50 ft. and is of potential economic value.

The blackfin is evidently of northern distribution being more common in Lake Nipigon than in the other Great Lakes.

Cristivomer namaycush (Walbaum). LAKE TROUT; GRAY TROUT

The lake trout is sufficiently plentiful to be sought as a game fish. The Ontario Government has planted fry on several occasions as follows:

1920—200,000	1923—50,000
1922—100,000	1924—20,000

Salvelinus fontinalis (Mitchill.) BROOK TROUT

We did not take this species while at the lake, but two specimens have been sent to us from the district by Mr. H. Youmans. It is reported as abundant in the streams flowing into the lake. The following plants of fry have been made by the Provincial Government:

1925—5,000	1926—5,000

Catostomus commersonii (Lacépède). COMMON SUCKER

This species is abundant in Long Lake. In one seine haul we took between fifteen and twenty thousand, ranging in length from one to one and a half inches.

Catostomus catostomus (Forster). LONG-NOSED SUCKER

Specimens of this species were taken, but it is evidently not so common as the preceding.

Couesius plumbeus (Agassiz). LAKE CHUB

The lake chub is abundant in some localities but is not generally distributed.

Rhinichthys cataractae (Cuvier and Valenciennes). LONG-NOSED DACE

One small specimen of this species was taken.

Notropis heterolepis Eigenmann and Eigenmann. BLACK-NOSED MINNOW

A few specimens were taken at the head of a shallow reedy bay which had a mud bottom.

Notropis hudsonius (DeWitt Clinton). SPOT-TAILED MINNOW

This minnow is widely distributed in the lake, but is seldom abundant, being most common among higher aquatic plants in sheltered bays.

Esox lucius Linnaeus. PIKE

The pike is common, especially in the shallow water at the north and south ends of the lake, and in bays.

Percopsis omisco-maycus (Walbaum.) TROUT PERCH

The trout perch was found to be rather uncommon.

Perca flavescens (Mitchill). YELLOW PERCH

The perch is abundant all around the shores and especially in the shallow water at the north end of the lake where it reaches a size of $7\frac{1}{8}$ inches and is highly coloured.

Stizostedion vitreum (Mitchill). PIKE PERCH; YELLOW PICKEREL

Like the perch, this species is most abundant at the north end of the lake although fairly generally distributed. It is the best food and game fish in the lake. In 1925 the Provincial Government planted 500,000 fry.

Percina caprodes zebra (Agassiz). LOG PERCH

This fish is more common and reaches a larger size than in Lake Nipigon. (Dymond 1926.)

Poecilichthys exilis (Girard). IOWA DARTER

A few specimens of this darter were taken at the head of a sheltered muddy bay in association with *N. heterolepis*. This association accompanied by *N. hudsonius*, *E. lucius* and *P. flavescens*, is quite common. (Dymond 1926, Dymond and Hart 1927.)

Cottus ricei Nelson. RICE'S SCULPIN

One specimen of this sculpin was taken from the stomach of a ling.

Cottus cognatus Richardson. MILLER'S THUMB

The miller's thumb is common over sandy and gravelly beaches. It is more common and more strongly barred than in Lake Nipigon.

Eucalia inconstans (Kirtland). BROOK STICKLEBACK

This stickleback is present, but not common in Long Lake. Our largest specimen measured $1\frac{1}{4}$ in.

Pungitius pungitius (Linnaeus.) NINE-SPINED STICKLEBACK

The nine-spined stickleback is very abundant in most situations. Our largest specimen measured about $2\frac{1}{4}$ in. All of the larger specimens were parasitized by a species of *Schistocephalus*, whereas only about 20% of specimens from Lake Nipigon were so parasitized.

Lota maculosa (LeSueur). LING

The ling was found to be very common in deep water.

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